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THE DUFRENITE LOCALITY AT MIDVALE, ROCKBRIDGE COUNTY, VIRGINIA

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The Virginia locality of the rare mineral dufrenite is generally designated in collections as "Rockbridge County, Va." Writers affecting greater precision have given it as "ten miles east of Lexington, Va.," or, erroneously, as 3 miles west of this town. The old iron mines which produced this mineral are located on the crest of the Blue Ridge, about $1\frac{1}{2}$ kilometers (one mile) southeast of Midvale,—a small station on the Norfolk and Western R. R., about 35 km. north of Natural Bridge.

Small dumps just west of the South River road, about a kilometer south of the station, serve to locate the site of the washer. The ore was brought down from the mountain by a tramway which extended directly eastward. The mines may be reached by following the tramway up the mountain, after crossing the stream on a log bridge south of the site of the washer. As this route is rather steep and somewhat overgrown, it is preferable to ascend by an old road which parallels it to the south. The road is replaced by a trail over talus blocks of "Erwin" quartzite, joining the tramway in a cut of this rock.

The mines are quite overgrown, but the dumps are easily accessible. The ore deposits occurred apparently in a brecciated ferruginous sandstone or conglomeratic member of the "Unicoi" formation, as the dumps consist largely of this material. Occasionally a mass of radiating greenish-black dufrenite, altered on the surface to limonite, may be found. Veins of an iron hydroxide mineral occur thruout the sandstone, often exhibiting a slight translucency, being blood-red by transmitted light. Strengite is present, tho rare, very minute adamantine brown and reddish crystals occurring on dufrenite, or in fractures in the sandstone. One specimen showed a minute amount of

green cacoxenite. Specimens of dufrenite may also be picked up on the dump on the site of the washer.

An abandoned manganese mine is situated on a spur of the Blue Ridge about $1\frac{1}{2}$ km. northeast of Midvale, but specimens of pyrolusite are the only thing obtainable there.

CALCULATION IN THE TRICLINIC SYSTEM ILLUSTRATED BY ANORTHITE

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(*Continued from page 194*)

2. *Determination of* v_0 *from the angles of terminal faces.* Figure 44 and Tables 5 and 6

In figure 44 let $F_1 = p_1q_1$, and $F_2 = p_2q_2$ be any two terminal faces for each of which we have measured the pole distances $\rho_1\rho_2$ and the vertical circle readings V_1, V_2. These two faces determine a zone, Z, in which there must lie, at its intersection with the prism zone, a possible prism face. The symbol of this prism will be ∞ q where $q = \dfrac{q_2 - q_1}{p_2 - p_1}$.

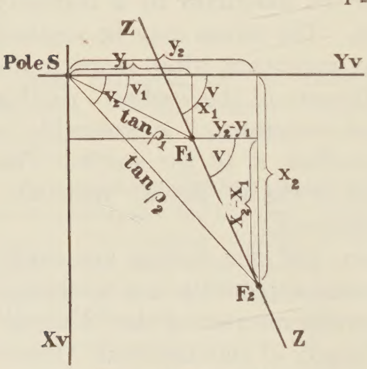

Fig. 44 (Parsons)

The angle v of all such prisms ∞ q determined by any pair of terminal faces can be calculated and will give a set of values which may be compared with the measured prism angles. Or the calculation may be confined as is here done to pairs of faces lying parallel to the direction line of 0 ∞, each of which will give a value of v_0. In figure 44 let X_v and Y_v be rectangular coördinates, the latter having the direction determined by S, the projection center, and the zero direction of the V values. From the figure it is evident that:

$$x_1 = \sin v_1 \tan \rho_1 \qquad x_2 = \sin v_2 \tan \rho_2$$

$$y_1 = \cos v_1 \tan \rho_1 \qquad y_2 = \cos v_2 \tan \rho_2$$

and that:

$$\tan v = \frac{x_2 - x_1}{y_2 - y_1}$$

In Table 5 the values x and y for each terminal face are calculated.

TABLE 5. CALCULATION OF X AND Y OF TERMINAL FACES

No.	V	ρ	log sin V log tan ρ log cos V	log x log y	x y
8	255°06′	69°20′	998 515 042 342 941 016	040 857 983 358	$\bar{2}.5619$ $\bar{0}.6817$
2	235 42	61 20	991 703 026 223 957 091	017 926 001 314	$\bar{1}.5110$ $\bar{1}.0307$
3	245 32	35 14	995 914 984 899 961 717	980 813 946 616	$\bar{0}64.29$ $\bar{0}.2925$
6	141 21	69 07	979 558 041 847 989 264	021 405 031 111	1.6370 $\bar{2}.0469$
10	147 19	37 00	973 239 987 711 992 514	960 950 980 225	0.4069 $\bar{0}.6342$
7	181 04	9 17	826 988 921 341 999 992	748 329 921 333	$\bar{0}.0030$ $\bar{0}.1634$
17	27 21	26 12	966 221 969 202 994 852	935 423 964 054	0.2266 0.4371
14	313 19	48 37	986 188 005 497 983 634	991 685 989 131	$\bar{0}.8257$ 0.7786
16	85 49	51 57	999 884 010 641 886 301	010 525 896 942	1.2742 0.0932
1	198 14	54 56	949 539 015 370 997 763	964 909 013 113	$\bar{0}.4457$ $\bar{1}.3531$
27	19 14	70 38	951 774 045 407 997 506	997 181 042 913	0.9372 2.6859

In Table 6 these values are paired as above described to obtain a series of values of v_0.

It will be noticed that face No. 1 gives results that are not in accord with the other values but reference to table 4 shows that

Table 6. Calculation of v_0 from values of Table 5.

Nos.	$x_2 - x_1$, $y_2 - y_1$	log $(x_2 - x_1)$, log $(y_2 - y_1)$	log tan v_0	v_0
8 and 2	1.0509 $\bar{0}$.3490	002 157 954 283	047 874	[$\bar{7}1°38'$]
8 and 1	2.1162 0.6714	032 560 982 698	049 862	[$\bar{7}2$ 24]
8 and 6	4.1989 1.3652	062 314 013 599	048 715	$\bar{7}1$ 57
2 and 1	1.0653 0.3224	002 745 950 840	051 905	[$\bar{7}3$ 10]
2 and 6	$\bar{3}$.1480 $\bar{1}$.0162	049 807 000 697	049 110	$\bar{7}2$ 07
1 and 6	$\bar{2}$.0827 0.6938	031 863 984 123	047 740	[$\bar{7}1$ 35]
3 and 10	1.0598 0.3417	002 523 953 364	049 159	$\bar{7}2$ 08
14 and 17	1.0523 0.3415	002 216 953 339	048 875	$\bar{7}2$ 01
14 and 16	2.0999 0.6854	032 220 983 594	048 626	$\bar{7}1$ 56
17 and 16	1.0476 0.3439	002 019 953 643	048 376	$\bar{7}1$ 50

Average of all 72°0.46′ Average of 6 best 72°00′

this face is not in accord with the other faces. The poor value obtained from faces 8 and 2 is due to a displacement of face No. 2 both on the vertical and horizontal circles. In general the results obtained by this method of averaging will be less accurate than by the first method.

3. Determination of v_0 from the Angles of Prism Faces

One of the well-known relations between faces in a zone may be stated as follows: If the angles between three faces of known indices in a zone are known, the angle to a fourth face in the zone with given indices may be calculated. If now we take the measured faces of the prism zone by threes and, employing this relation, calculate the position of the face 010 or 0∞, we obtain a series of independent values of v_0. The Goldschmidt symbol for a prism may be written as $p/q\infty$ or as $\infty q/p$; and the latter quantity, a rational quantity, may be equally well written as simply q. Take three prism faces, ∞q_1, ∞q_2, and ∞q_3, whose angles as read on the vertical circle are v_1, v_2, and v_3;

TABLE 7

CALCULATION OF v_0 FROM THE PRISMATIC FACES

No. " "	Symbol " "	q_3 q_2 q_1	Q $1-Q$	v_3 v_2 v_1	v_3-v_2 v_2-v_1	$\cot(v_3-v_2)$ $\cot(v_2-v_1)$	$Q\cot(v_3-v_2)$ $(1-Q)\cot(v_2-v_1)$	Diff $=\cot(v_0-v_2)$ v_0-v_2	v_0
22 23 24	∞ $\infty\bar{\infty}$ $\infty\bar{3}$	1 $\bar{1}$ $\bar{3}$	$\frac{1}{2}$ $\frac{1}{2}$	410°06′ 350°35′ 319°00′	59°31′ 31°35′	1.6265368 0.5886533	.8132684 .2943267	.5189417 117°25′	108°00′
21 22 23	$\infty 3$ ∞ $\infty\bar{\infty}$	3 1 $\bar{1}$	$\frac{1}{2}$ $\frac{1}{2}$	438°40′ 410°06′ 350°35′	28°34′ 59°31′	1.8366713 0.5886533	.9183357 .2943267	.6240090 58°02′	108°08′
21 22 24	$\infty 3$ ∞ $\infty\bar{3}$	3 1 $\bar{3}$	$\frac{1}{3}$ $\frac{2}{3}$	438°40′ 410°06′ 319°00′	28°34′ 91°06′	1.8366713 0.0192010	.6122238 .0128007	.6250345 57°59′	108°05′
21 23 24	$\infty 3$ $\infty\bar{\infty}$ $\infty\bar{3}$	3 $\bar{1}$ $\bar{3}$	$\frac{2}{3}$ $\frac{1}{3}$	438°40′ 350°35′ 319°00′	88°05′ 31°35′	0.0334648 1.6265368	.0223097 .5421789	.5198692 117°28′	108°03′
12 11 4	$\infty 3$ ∞ $\infty\bar{\infty}$	3 1 $\bar{1}$	$\frac{1}{2}$ $\frac{1}{2}$	258°04′ 229°57′ 170°27′	28°07′ 59°30′	1.7954162 0.5890450	.8977081 .2945225	.6031856 58°54′	108°51′
12 11 5	$\infty 3$ ∞ $\infty\bar{3}$	3 1 $\bar{3}$	$\frac{1}{3}$ $\frac{2}{3}$	258°04′ 229°57′ 138°57′	28°07′ 91°00′	1.7954162 0.0174551	.5984721 .0116367	.6101088 58°37′	108°34′
12 4 5	$\infty 3$ $\infty\bar{\infty}$ $\infty\bar{3}$	3 $\bar{1}$ $\bar{3}$	$\frac{2}{3}$ $\frac{1}{3}$	258°04′ 170°27′ 138°57′	87°37′ 31°30′	0.0416210 1.6318517	.0277473 .5439506	.5162033 117°18′	108°45′
11 4 5	∞ $\infty\bar{\infty}$ $\infty\bar{3}$	1 $\bar{1}$ $\bar{3}$	$\frac{1}{2}$ $\frac{1}{2}$	229°57′ 170°27′ 138°57′	59°30′ 31°30′	0.5890450 1.6318517	.2945225 .8159259	.5214034 117°32′	107°59′

as the fourth face take 0∞ whose angle v_0 we wish to find. Then it may be proved that the following relation holds:

$$\cot(v_0 - v_2) = Q \cot(v_3 - v_2) - (1 - Q)\cot(v_2 - v_1),$$

where

$$Q = \frac{q_3 - q_2}{q_3 - q_1}.$$

In Table 7 is shown the result of the application of this formula to the measurements obtained. In this calculation only those faces which are in the same half-circle can be used. Where one of the faces is on the opposite side of the zero-point from the other two, 360° should be added to the readings that are less than 180° in order to avoid the use of negative quantities. Average of 8 values of $v_0 = 108°18'$ or $\overline{71}°42'$. But face 12 is badly out of position, as seen in the calculations of Table 4. Using therefore the five values for v_0 which do not depend upon face 12, the average is 108°02′ or $\overline{71}'58°$.

Summary of values of v_0.

Table 4,	18 faces	give average of	$\overline{71}°57'$
" 6,	6 values	" "	72 00
" 7,	5 "	" "	71 58
		Weighted average	$\overline{71}°58'$

The calculation of v_0 gives the position of the face 010, but gives no direct clue as to the further use of the value obtained. As the negative end of the crystal has been measured it will be necessary in calculating V^- to use the supplement 71°58′ as a negative quantity.

After the calculation of v_0 this value is subtracted from the vertical circle readings, thus securing the value V^-, or the reading on the vertical circle when the face 010 is at the zero position.

$V - v_0 = V^-$ which may also be indicated as φ'.

For the arithmetical calculation of the crystal constants this value, with the corresponding ρ values, is all that are required, but for comparing angles with those given in tables it is necessary to make a further adjustment to obtain the angle φ corresponding to V^+.

In the triclinic system the angle φ is measured from the zero position, and is never greater than 180°, so that positive and negative values are given.

When V^+ is less than 180°

$$V^+ - 0° = \varphi$$

When V^+ is greater than 180°

$$V^+ - 360° = \varphi.$$

In the present case, where the negative end of the crystal has been measured, the subtraction of v_0 from V gives a value which will be indicated by V^-. To convert the V^- values to V^+ use is made of the following formula:

$$360° - (V^- - 180°) = V^+$$

Calculation of the Projection Elements

The calculation of these elements may now proceed by means of the formulas given on page 186.

$$(3)\ x' = x_0' + pp_0' \sin \nu,$$

$$(4)\ y' = y_0' + qq_0' + pp_0' \cos \nu.$$

The values of x′ determined in table 3 are introduced into equation 3 as shown in table 8. Faces with like values of p are grouped to yield average values and a series of equations is secured. These are then solved in pairs for the two unknown quantities. Similarly in table 9 the equations (4) with values of y′ from table 3 introduced are collected and solved in pairs for the three unknown quantities. Figure 40 shows clearly the significance of the values obtained and examination of figures 38 and 39, where the symbols of each face are shown, will reveal the influence of the positive or negative values of p and q upon the form of the equations.

Summary of Projection Elements

$x_0' = 0.4844$	$p_0' = 0.9590$	$\nu = 87°08'$
$y_0' = 0.0795$	$q_0' = 0.5521$	$\frac{p_0'}{q_0'} = 1.7370$

Calculation of ν from the Prisms

In figure 40 imagine a line drawn thru 0 and the face-pole pq. This would be the direction-line of the prism $\infty(q/p)$. Let the angle which it makes to the line thru 0 and 0∞ be φ_1. Then from the figure:

$$\tan \varphi_1 = \frac{pp_0 \sin \nu}{qq_0 + pp_0 \cos \nu}$$

which can also be written

$$\tan \varphi_1 = \frac{\frac{p^0}{q_0} \cdot \sin \nu}{\frac{q}{p} + \frac{p_0}{q_0} \cdot \cos \nu}.$$

If we consider the unknown quantities in this equation to be

$$A = \frac{p_0}{q_0} \cdot \sin \nu \text{ and } B = \frac{p_0}{q_0} \cdot \cos \nu,$$

we can substitute these values as follows:

$$\tan \varphi_1 = \frac{A}{\frac{q}{p} + B} \text{ or } A \cot \varphi_1 = \frac{q}{p} + B.$$

Taking now two prisms $\infty q_1/p_1$ with angle φ_1 and $\infty q_2/p_2$ with angle φ_2 and introducing their known values in the last equation we contain:

$$A \cot \varphi_1 = \frac{q_1}{p_1} + B \text{ and } A \cot \varphi_2 = \frac{q_2}{p_2} + B$$

TABLE 8

CALCULATION OF x_0' AND p_0' SIN ν

Numbers are values of x' taken from Table 3.

A	17 $p = 0$	$.4856 = x_0'$	
	14 $p = 0$	$.4844 = x_0'$	
	16 $p = 0$	$.4834 = x_0'$ $.4844 = x_0'$	
B	3 $p = \bar{1}$	$.\bar{4}773 = x_0' - p_0' \sin \nu$	
	10 $p = \bar{1}$	$.\bar{4}769 = x_0' - p \ \sin \nu$	$.4771 = x_0' - p_0' \sin \nu$
C	8 $p = \bar{2}$	$\bar{1}.4419 = x_0' - 2p_0' \sin \nu$	
	2 $p = \bar{2}$	$\bar{1}.4483 = x_0' - 2p_0' \sin \nu$	
	6 $p = \bar{2}$	$\bar{1}.4390 = x_0' - 2p_0' \sin \nu$	
	1 $p = \bar{2}$	$\bar{1}.4246 = x_0' - 2p_0' \sin \nu$	$1.4384 = x_0' - 2p_0' \sin \nu$
D	27 $p = 2$	$2.8443 = x_0' - 2p_0' \sin \nu$	$2.8443 = x_0' + 2p_0' \sin \nu$
E	7 $p = \frac{\bar{2}}{3}$	$.1563 = x_0' - \frac{2}{3}p_0' \sin \nu$	$.1563 = x_0' - \frac{2}{3}p_0' \sin$

From

A & B $x_0' = .4844$ $p_0' \sin \nu = .9615$

B & C $x_0' = .4842$ $p_0' \sin \nu = .9613$

A & E $p_0' \sin \nu = .9610$

Best x_0' .4844 $p_0' \sin \nu = .9613$

TABLE 9

CALCULATION OF y_0', q_0' AND $p_0' \cos \nu$

Numbers are values of y' taken from Table 3

A 17	$p = 0$	$q = 0$	$0.0795 = y_0$	$y_0' = 0.0795$
B 14	$p = 0$	$q = \bar{2}$	$1.0264 = y_0' - 2q_0'$	
16	$p = 0$	$q = 2$	$1.1826 = y_0' + 2q_0'$	$y_0' = 0.0781$
C 3	$p = \bar{1}$	$q = \bar{1}$	$0.5206 = y_0' - q_0' - p_0' \cos \nu$	
10	$p = \bar{1}$	$q = 1$	$0.5838 = y_0' + q_0' - p_0' \cos \nu$	$2y_0' - 2p_0' \cos \nu = 1.0632$
D 8	$p = \bar{2}$	$q = \bar{4}$	$2.2247 = y_0' - 4q_0' - 2p_0' \cos \nu$	
6	$p = \bar{2}$	$q = 4$	$2.1907 = y_0' + 4q_0' - 2p_0' \cos \nu$	$2y_0' - 4p_0' \cos \nu = 0.0340$
E 2	$p = \bar{2}$	$q = \bar{2}$	$1.1173 = y_0' - 2q_0' - 2p_0' \cos \nu$	$y_0' - 2q_0' - 2p_0' \cos \nu = 1.1173$
F 1	$p = \bar{2}$	$q = 0$	$0.0045 = y_0' - 2p_0' \cos \nu$	$[y_0' = 0.0271]$
27	$p = 2$	$q = 0$	$0.0587 = y_0' + 2p_0' \cos \nu$	

From			
A	$y_0' = 0.0795$		
B	$y_0' = 0.0781$	$q_0' = 0.5522$	
C		$q_0' = 0.5522$	
D		$q_0' = 0.5519$	
C & D	$y_0' = 0.0802$		
A & C			$p_0' \cos \nu = 0.0479$
A & D			$p_0' \cos \nu = 0.0482$
Mean	$y_0' = 0.0795$	$q_0' = 0.5521$	$p_0' \cos \nu = 0.0480$

But $\tan \nu = \dfrac{p_0' \sin \nu}{p_0' \cos \nu} = \dfrac{.9613}{.0480} \quad \therefore \nu = 87°08\tfrac{1}{4}'$

and by substitution $p_0' = 0.9590$

Solving for A we obtain:

$$A = \frac{\dfrac{q_1}{p_1} - \dfrac{q_2}{p_2}}{\cot \varphi_1 - \cot \varphi_2}.$$

Performing this operation for successive pairs of prisms and substituting the mean value of A in the same equations, we obtain a series of values for B of the form:

$$B = A \cot \varphi_1 - \frac{q_1}{p_1} = A \cot \varphi_2 - \frac{q_2}{p_2} = \cdots.$$

Combining the original equations for A and B, we have $B/A = \cot \nu$. Substituting ν in the same equations we obtain

$$\frac{p_0}{q_0} = \frac{p_0'}{q_0'} = \frac{A}{\sin \nu} = \frac{B}{\cos \nu}.$$

TABLE 10

CALCULATION OF ν AND $\frac{p'_0}{q'_0}$ FROM PRISMS

Values from table 2.

No. of Face.	Symb.	φ.	$\frac{q}{p}$.	cot φ.	$\dfrac{\frac{q_1}{p_1}-\frac{q_2}{p_2}}{\cot\varphi_1-\cot\varphi_2}=A.$	$A\cot\varphi-\frac{q}{p}=B.$
12	$\infty 3$	330°01′	3	1.7332	$\frac{2}{1.1108}=\frac{1}{0.5554}$	$\frac{1.7332}{0.5731}-3=\frac{0.0139}{0.5731}$
11	∞	301 54	1	0.6224	$\frac{2}{1.1452}=\frac{1}{0.5726}$	$\frac{0.6224}{0.5731}-1=\frac{0.0493}{0.5731}$
4	$\infty\ \bar{\infty}$	242 24	$\bar{1}$	$\bar{0}.5228$	$\frac{2}{1.1481}=\frac{1}{0.5740}$	$\frac{\bar{0}.5228}{0.5731}+1=\frac{0.0503}{0.5731}$
5	$\infty\bar{3}$	210 54	$\bar{3}$	$\bar{1}.6709$	$\frac{\bar{6}}{3.4468}=\frac{1}{0.5745}$	$\frac{\bar{1}.6709}{0.5731}+3=\frac{0.0484}{0.5731}$
21	$\infty 3$	150 37	3	1.7759	$\frac{2}{1.1498}=\frac{1}{0.5749}$	$\frac{1.7759}{0.5731}-3=\frac{0.0566}{0.5731}$
22	∞	122 03	1	0.6261	$\frac{2}{1.1459}=\frac{1}{0.5729}$	$\frac{0.6261}{0.5731}-1=\frac{0.0530}{0.5731}$
23	$\infty\ \bar{\infty}$	62 32	$\bar{1}$	$\bar{0}.5198$	$\frac{2}{1.1478}=\frac{1}{0.5739}$	$\frac{\bar{0}.5198}{0.5731}+1=\frac{0.0533}{0.5731}$
24	$\infty\bar{3}$	30 57		$\bar{1}.6676$	$\frac{\bar{3}}{\bar{1}.6676}=\frac{1}{0.5558}$	$\frac{\bar{1}.6676}{0.5731}+3=\frac{0.0517}{0.5731}$
18	0∞	359 59	0	∞		

Average value of A $=\frac{1}{0.5731}$, which is used in calculating the values of the last column. Average value of B $=\frac{0.0518}{0.5731}$.

These operations are contained in table 10 which gives the following results:

$$A\text{ (av. of 7)} = \frac{1}{0.5731}.\quad B\text{ (av. of 7)} = \frac{0.0518}{0.5731}.\quad \frac{B}{A} = \cot\nu = .0518.$$

Therefore $\nu = 87°02'$. From tables 8 and 9, $\nu = 87°08'$.

Av. $\nu = 87°05'$.

$\frac{p_0'}{q_0'} = 1.7472$. From tables 8 and 9, $\frac{p_0'}{q_0'} = 1.7370$.

Av. $\frac{p_0'}{q_0'} = 1.7421$.

We use this last value for a revision of p_0' and q_0' as follows: $p_0' + q_0' = 1.5111$, $p_0'/q_0' = 1.7421$. Combining we obtain $p_0' = .9600$, $q_0' = .5511$.

Calculation of Polar Elements

See page 188.

$$x_0' = 0.4844, \qquad p_0' = 0.9600, \qquad \nu = 87°05'.$$
$$y_0' = 0.0795, \qquad q_0' = 0.5511,$$

$$\delta = \varphi \text{ of the face } 0. \quad \tan\delta = \frac{x_0'}{y_0'} = 6.093, \ \delta = 80°41',$$
$$\text{Measured } \delta = 80'42',$$

$$\rho_0 = \rho \text{ of the face } 0. \quad \tan\rho_0 = \frac{x_0'}{\sin\delta} = 0.4909, \ \rho_0 = 26°08',$$
$$\text{Measured } \delta = 26°12',$$

$d' = \tan\rho_0 = 0.4909$,	$p_0 = p_0' \cos\rho_0 = 0.8619$,
$x_0 = x_0' \cos\rho_0 = 0.4349$,	$q_0 = q_0' \cos\rho_0 = 0.4948$,
$y_0 = y_0' \cos\rho_0 = 0.0714$,	$r_0 = 1$,
	$\lambda = 85°54'$,
$\cos\lambda = y_0 = 0.0714$,	$\mu = 64°02'$,
$\cos\mu = y_0 \cos\nu + x_0 \sin\nu$,	$\nu = 87°05'$.

Calculation of Linear Elements

Formulas, see page 189.

$a = 0.6369$,	$\alpha = 93°08\frac{1}{2}'$,
$b = 1$,	$\beta = 115°50\frac{1}{2}'$,
$c = 0.5496$,	$\gamma = 91°15'$.

For the model of this discussion the reader is referred to a paper by Borgström and Goldschmidt, *Krystallberechnung im triklinen System, illustriert am Anorthit.*[1] The discussion is there even fuller and the derivation of several formulas used above without proof may there be found. The projection and drawing of an anorthite crystal in an earlier paper of this series, page 92, will also help to illustrate the present discussion.

[1] *Z. Kryst. Min.*, **41**, 63–91, 1905.

LIST OF TRICLINIC MINERALS INCLUDED IN GOLDSCHMIDT'S WINKELTABELLEN. Edgar T. Wherry. *Washington, D. C.*—The triclinic minerals are arranged as were those of the two preceding systems in the order of increasing values of axis *a*. The approximate values of the three axial angles are given here.

Triclinic Minerals

	a	c	α	β	γ	Page
Fairfieldite	0.28	0.20	102	95	77	138
Chalcanthite (Kupfervitriol)	0.53	0.52	113	107	93	210
Lansfordite	0.55	0.57	95	100	92	212
Sassolite	0.58	0.53	104	93	90	311
Albite (Schuster's data)	0.62	0.56	94	117	89	139
Anorthite	0.63	0.55	93	116	91	141
Albite (Brezina's data)	0.64	0.56	94	117	88	140
Hannayite	0.70	0.97	123	127	54	170
Veszelyite	0.71	0.91	90	104	90	359
Amblygonite	0.73	0.76	109	98	106	37
Amarantite	0.77	0.57	85	90	97	36
Axinite	0.78	0.98	92	82	103	58
Chalcosiderite	0.79	0.61	93	94	108	93
Cyanite, Kyanite	0.90	0.70	90	100	106	106
Inesite	0.98	1.32	92	133	94	189
Hiortdahlite	1.0–	0.35	89	91	90	178
Babingtonite	1.12	1.83	94	112	86	286
Rhodonite	1.16	1.83	95	111	86	287
Roselite	1.31	0.91	91	91	89	296
Roemerite	2.64	0.97	100	95	64	295
Pseudomalachite (Lunnite)	2.83	1.53	89	91	91	224

This concludes the series of articles on the Goldschmidt two-circle method. They are all to be reprinted, in a single pamphlet, for the use of teachers and students of crystallography.

PROCEEDINGS OF SOCIETIES

Philadeplhia Mineralogical Society

Wagner Free Institute of Science, October 14, 1920

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Dr. Burgin, in the chair. Fourteen members and four visitors were present.

The following officers were elected for 1920–1921; President: Dr. Alfred C. Hawkins; vice-president: Mr. Harry W. Trudell; Treasurer: Mr. Harry A. Warford; Secretary: Mr. Samuel G. Gordon.

Mr. Trudell reported a trip to Lenni and Dismal Run, Delaware County, attended by Messrs. Ford, Frankenfield, Knabe, Jones, Gordon, and himself. Mr. Hoadley gave an account of collecting experiences in Connecticut during the past summer, specimens being exhibited. Mr. Gordon described an Ordovician basalt flow in Lebanon County; no zeolites were found; and reported that Mr. Oldach had found arsenopyrite and erythrite at Robeson, Berks County. Dr. Hawkins described a trip taken by Mr. Gordon and himself along the Susquehanna River in Maryland.

Dr. Hawkins then took the chair, briefly addressing the Society on its past work.

Mr. Groth presented the name of Mr. Ralph W. Emerson for active membership.

SAMUEL G. GORDON, *Secretary.*

NEW YORK MINERALOGICAL CLUB

The Regular Monthly Meeting of the New York Mineralogical Club was held in the Assembly Room of the American Museum of Natural History, on the evening of October 20, at 8.15 P.M.

The President, Dr. George F. Kunz, presided and there was an attendance of 26 members and guests. The minutes of the last meeting were read and approved. The following names were submitted for membership to the Committee on Nominations: Mr. Everett D. Carlson, and Miss Mary F. C. Stockman.

The Recording Secretary exhibited some fine group photographs taken by Mr. Broadwell at the Burke Avenue locality during the visit by the Club on Decoration Day last. He appealed to the members for photographs of former Club field days for the Club Collection of such records. He also announced that the Club file of the AMERICAN MINERALOGIST was now complete with the exception of 3 numbers.

Exhibition and discussion of minerals collected during the summer: Mr. Whitlock exhibited a crystal of transparent colorless apatite from Burke Avenue, of unusual habit, resembling those from Tyrol; some small sphalerite crystals, collected by Mr. Papke, from Snake Hill, N. J., showing unique twinning; and sharp well developed scheelite crystals from Trumbull, Conn.

Mr. Grenzig showed several minerals collected from the vicinity of Franklin Furnace, N. J., including an especially large and perfect hornblende crystal from Hardyston, and an unusual willemite from Franklin. Miss Katherine Schroder showed a number of minerals collected from Worthington and Cummington, Mass. These included tourmaline and garnet in mica schist and rhodonite from Cummington, also garnets in schist and hornblende from Worthington.

Mr. H. Papke showed a fine series of the zeolites together with datolite and calcite from recent exposures at Snake Hill, N. J.; also pyrite in crystallized nodules on lignite from Kreisherville, Staten Island.

Mr. Hoadley reported an unusually active collecting season including visits to 21 localities: *Birdsboro, Joanna, O'Neills Quarry,* and *St. Peters, Pa.*; finds here included epidesmine, the rare new zeolite, (see Sept. no.), from the first locality. *Long Hill, Haddam Neck, Portland,* and *East Hampton, Conn.;* many interesting pegmatite minerals were obtained. *Franklin Furnace, Sterling Hill,* and *McAfee, N. J.; Queensboro, Orange Co., N. Y., Westmoreland, N. H.,* and *Saratoga Springs, N. Y.; Allaire,* and *Paterson, N. J.; West Chester, Pa.,* finding colerainite, recently discovered there, and *Oreland, Pa.; Burke Ave., Bronx,* finding apatite, wernerite, garnet, pink calcite, epidote, oligoclase, microcline, biotite and titanite; and finally, *Collinsville, Conn.,* and *S. Strafford, Vt.*

Dr. Kunz reported a visit to the tungsten mines at Boulder, Colorado, and showed a series of the ore minerals including ferberite. He also exhibited beautiful specimens of carnotite and autunite from Mesa Co., New Mexico,

and some fibrous chalcedony from Cody, Wyoming. He presented to the American Museum of Natural History the ferberite and carnotite, together with a series of lava and other materials used in the school of carving at Torre del Greco, Italy.

On a motion by Mr. Stanton the Club was authorized to purchase from Mr. Grenzig the unique specimen of hornblende from Hardyston, N. J., exhibited by him, and to present it to the collection of the American Museum of Natural History. This gift, together with those of Dr. Kunz, was acknowledged by the Recording Secretary on behalf of the Museum, with the thanks of the Department of Mineralogy for the spirit of generosity and public service which prompted them.

On behalf of the Committee on Excursions, Capt. Miller reported the possibility of arranging for a blast at the Mercer Quarry, West Paterson, on Election Day, and suggested that the Club consider this locality as an objective for this field day. This was accepted, with Kreisherville, Staten Island, as an alternative. Herbert P. Whitlock, *Recording Secretary.*

NOTES AND NEWS

We wish to make this department one of the features of this magazine, and hope our readers will send us all items of interest which may come to their attention. News about mineral collections, finds of rare minerals or unusually fine specimens of well-known ones, and other things of interest to collectors will be especially welcome. [Ed.]

At Columbia University the department of mineralogy has been combined with that of geology, and Dr. Lea McI. Luquer has been promoted to be associate professor of mineralogy.

Dr. George I. Adams, for some years engaged in teaching mineralogy and allied subjects in China, has returned to this country and has been appointed professor of geology and mineralogy at the University of Alabama.

The new collection of New England minerals in the Boston Society of Natural History was opened to the public on November 1st. From the account of this collection, published in the *Bulletin* of the Society (No. 23, pages 3–7, October, 1920), it is evident that it represents a remarkably fine and complete assemblage of the minerals of that region.

In response to our note in the July number that Professor Tschermak, the eminent Austrian mineralogist, was in need of food, the sum of $10 was made up by contributions from our subscribers, and has been forwarded to him thru the Geological Society of Washington. Professor Edward S. Dana and Dr. George F. Kunz have called our attention to the fact that another scientist in Vienna is in similar straits,—Professor Victor von Lang, the mineralogist and physicist. Can we not help him also?

Professor Austin F. Rogers, of Stanford University, is making a study of the mineralogy of fossil bone, and will appreciate receiving small specimens for investigation, if any of our readers can furnish them.

Mr. Edwin C. Mott, of Yonkers, New York, whose activities in furnishing that city with an exhibition collection of minerals have been already noted in this column (See number for April, 1920), has kindly sent us copies of newspapers describing further developments in this direction. Mrs. Elizabeth

N. Watrous, of New York, has donated a collection of upwards of 300 specimens, assembled by her grandfather, Aaron Erickson, of Staten Island, in the sixties. This collection, which includes many fine, showy, specimens, was catalogued by the late Henry A. Ward, and a printed and handsomely bound copy of his list accompanies the collection. The whole collection is now exhibited in five specially designed cases. It has now been decided to organize a Natural History Museum in Yonkers and a charter has been applied for, among the signers of the petition to incorporate being the mayor of the city, the superintendent of public instruction, and Colonel William Boyce Thompson, who has one of the finest private mineral collections in the world.

A work on mathematical crystallography which came out in Germany during the war has not previously been noted in this column. It is entitled "Geometrische Kristallographie des Diskontinuums," and the author is Professor Paul Niggli now of Zurich, Switzerland.

NOTE ON THE OPTICAL FLUORITE FROM MADOC, ONTARIO. C. W. Greenland. *Queens University*.—The occurrence of optical fluorite at Madoc has been described by Professor T. L. Walker.[1] The following additional features may prove of interest: Measurement by the minimum deviation method gave the refractive index $n_D = 1.4340$. The green color shown by the crystals when first taken out of the ground is greatly diminished by exposure to light. The property of thermoluminescence is well shown by this fluorite, and can be used for its identification. The prospectors in the region where it occurs place suspected material on a hot stove in a dark room, and fluorite, if present, is shown up by a striking bluish glow.

NEW MINERALS

CESÀROLITE

H. Buttgenbach and C. Gillet: [Separate, from *Ann. soc. geol. Belg.;* exact reference unknown.]

Name: In honor of Prof. G. Cesàro of Liége.

Physical Properties

Color steel gray; form, spongy mass resembling coke; friable. H. = 4.5. Sp. gr. = 5.29.

Chemical Properties

Composition, a manganate of lead, $H_2PbMn_3O_8$. Analysis: Pb 36.29, MnO 42.65, H_2O 3.30, O 13.26, Fe 0.49, Al 0.79, other metals 0.36, Na_2O 0.18, insol. 0.75, undetd. 1.93, sum 100.00%. Sb, As, Cu, Zn, Ca present in minor amounts; no CO_2 or S.

Occurrence.

In cavities in galenite at the lead mine at Sidi-Amer-ben-Salem, Tunis.

Relations.

Suggested to be a salt of the hypothetical acid $H_4Mn_3O_8$, similar to romanéchite, $(Mn,Ba)Mn_3O_8$. [May equally well be a colloidal adsorption-product. W.F.F.]

[1] *Am. Min.*, **4**, 95–96, 1919.

CORRECTIONS TO VOLUME 5

No. 1—P. 17: 8th line from bottom, in formula, for (Cu, Co) read CuCo.
No. 2—P. 39: 10th line, for CLUB read SOCIETY.
No. 3—P. 45: last line, for 573 read 572 and for 2 read 5.
P. 48: 17th line, sentence should read: The horizontal and vertical circles are graduated in degrees, but can be estimated to tenths of a degree.
P. 49: 9th column of table, topmost number, for 3 read 8.
last line, for 190 read 1908.
No. 4—P. 80: 8th line from bottom, the values for CaO and SO_3 should be interchanged, to read CaO 27.56, SO_3 12.98.
P. 84: 6th line from bottom, for Armo read Armour.
No. 5—P. ii : 7th line from bottom, for gnonomonic read gnomonic.
P. 93: last two lines, for leg read side.
P. 99: 12th to 15th line from bottom, the last words have become pied, in some copies, but their identity is evident.
P. 105: 10th line from bottom, for UO read UO_2.
No. 6—P. 120: 10th line from bottom, for Prosessor read Professor.
No. 7—P. 131: Lines stating authors and cities should be transposed.
P. 133: 2nd column, 15th line, for (sipylit) read (sipylite).
P. 135: 10th line, for Nationa read National.
11th line, from bottom, for laborary read laboratory.
No. 9—P. 164: Second column of table, take out heavy bracket lines and separate the letters from the symbols.
No. 10—P. 181: 15th line, for LISTS read LIST.

In addition to the above, slight changes will be made in several of the articles in the Goldschmidt Two-Circle method, when they are reprinted.